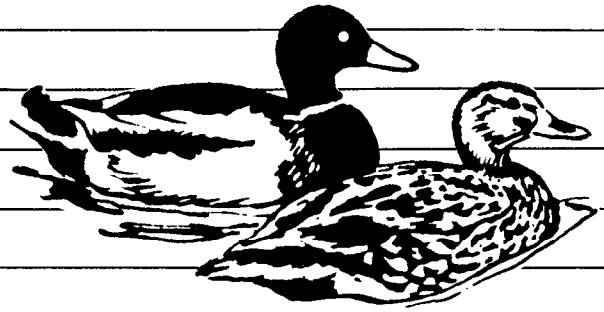
Research



Information bulletin

U.S. DEPARTMENT OF THE INTERIOR
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An Analysis of Shoreline Change and Wetland Loss in the Coastal Barrier Resources System

The Coastal Barrier Resources System (CBRS) is a network of undeveloped coastal barriers protected under the Coastal Barrier Resources Act of 1982. There are 186 units in the CBRS, ranging in size from less than 20 acres to more than 49,000 acres and extending from Maine to Texas. Barrier islands, barrier spits and peninsulas, bay barriers, and tombolos are all included in the system. We studied shoreline change and wetland loss in 19 of these coastal barrier units. We compared historic maps to 1982 maps to quantify changes, and examined the processes and human activities in and around the barriers to understand the causes of change. We found that in addition to natural changes, all but one of the 19 barriers had experienced some culturally related impacts.

Coastal change is occurring over the entire geographic stretch of the CBRS. Most of the change is erosion, but rates and direction of change are highly variable. This general trend of shoreline recession on the Atlantic and Gulf coasts is the result of several factors. The damming of many major rivers has significantly reduced the amount of sediment supplied to the coast and available for coastal barrier maintenance. Sea level has risen about 1 foot over the past century because of ocean warming and coastal subsidence. Transport of sediment from offshore sources to coastal barriers has slowed or halted as these sources have either been exhausted or now lie in waters too deep to be reached by ocean waves.

Impact of Human Activities

In the areas we examined, the construction of coastal stabilization structures (e.g., jetties and groins) has, in general, resulted in the acceleration of erosion within the CBRS. Stabilization structures alter the dynamic equilibrium of coastal processes. Sediment that accumulates around the structures to stabilize one segment of the shoreline does so at the expense of destabilizing other shoreline segments. The protection of developed areas on coastal barriers outside the CBRS is occurring at the expense of the undeveloped areas that are part of the CBRS.

Dredging, a widespread activity along the coast, affects the littoral zone in two ways. First, it creates sediment sinks (channels) that interrupt the littoral drift system; and second, it removes sediment from the littoral zone and places it in areas that are not available for shoreline maintenance (i.e., subaerial spoil piles). Dredging can sometimes be beneficial. For example, sediment can be dredged outside the littoral zone and deposited along the shoreline. Such beach nourishment is expensive but has been successful in slowing erosion rates along some beaches.

The widespread influences of human activities on coastal barriers are clearly shown in our study areas (Table 1). Dredging has occurred in or near 17 barrier units, 15 units have shoreline stabilization structures in or near them, and 8 units have dams upstream. Most area that have experienced human influences are eroding.

Impacts of Severe Storms

Hurricanes and major winter storms (northeasters) are also responsible for extensive changes in coastal barriers. All the study areas have experienced some impacts from

hurricanes or northeast storms. The largest amount of sand transport on coastal barriers is during these extreme events. Beaches may be eroded 100 ft. or more, dunes and marshes may be overwashed, and new inlets may be cut through barriers. Two study areas in Alabama and Louisiana clearly show these impacts.

While most of the CBRS units examined here have been undergoing net erosion during the last few decades, the loss of habitat due to beach erosion can be compensated by a gain in habitat on the bay side or downdrift end of a barrier if the barrier exists in a natural state. The entire barrier system moves in a landward or longshore direction or both. When barriers change in this manner, net fish and wildlife habitat is not lost, but homes would be, eventually ending up in the water. Development is the major agent resulting in loss of fish and wildlife habitat.

For further information, contact:

Mary C. Watzin
National Wetlands Research Center
1010 Gause Blvd.
Slidell, LA 70458
FTS: 680-7308
Comm.: (504) 646-7308

Table 1. Summary of human perturbations in the CBRS units in the study.

	No. of units by condition			
Human Perturbation	Eroding	Accreting	Stable	Total
Dredging	15	2	0	17
Structures-updrift	7	1	0	8
Structures-downdrift	5	2	0	7
Structures-within	7	2	0	9
Dams upstream	8	0	0	8
None	1	0	0	1
Number of study units per condition	16	3	0	19